



Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

CM25MD-24H

CIB Module

Three Phase Converter + Three Phase Inverter + Brake

25 Amperes/1200 Volts

Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	CM25MD-24H	Units
Power Device Junction Temperature	T_j	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Mounting Torque, M4 Mounting Screws	—	13	in-lb
Module Weight (Typical)	—	100	Grams
Isolation Voltage, AC 1 minute, 60Hz	V_{RMS}	2500	Volts

Converter Sector

Repetitive Peak Reverse Voltage	V_{RRM}	1600	Volts
Recommended AC Input Voltage	E_a	440	Volts
DC Output Current	I_o	25	Amperes
Surge (Non-repetitive) Forward Current	I_{FSM}	250	Amperes
i^2t for Fusing	I^2t	260	A^2s

IGBT Inverter Sector

Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 20	Volts
Collector Current	I_c	25	Amperes
Collector Current (Pulse)*	I_{CM}	50	Amperes
Emitter Current**	I_e	25	Amperes
Emitter Current** (Pulse)*	I_{EM}	50	Amperes
Maximum Collector Dissipation	P_c	104	Watts

Brake Sector

Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 20	Volts
Collector Current	I_c	25	Amperes
Collector Current (Pulse)*	I_{CM}	50	Amperes
Collector Dissipation	P_c	104	Watts
Repetitive Peak Reverse Voltage (Clamp Diode Part)	V_{RRM}	1200	Volts
Forward Current (Clamp Diode Part)	I_{FM}	25	Amperes

* Pulse width and repetition rate should be such that device junction temperature does not exceed maximum rating.

** Characteristics of the anti-parallel emitter-collector free-wheel diode.



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Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Converter Sector						
Repetitive Reverse Current	I_{RRM}	$V_R = V_{RRM}, T_j = 150^\circ\text{C}$	—	—	8	mA
Forward Voltage Drop	V_{FM}	$I_F = 25\text{A}$	—	—	1.5	Volts
Thermal Resistance (Junction-to-Fin)	$R_{th(j-f)}$	Per Diode	—	—	1.7	$^\circ\text{C/W}$
Brake Sector						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{V}, I_C = 25\text{A}, T_j = 25^\circ\text{C}$	—	2.7	3.4	Volts
		$V_{GE} = 15\text{V}, I_C = 25\text{A}, T_j = 150^\circ\text{C}$	—	2.45	—	Volts
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_{GE} = 0\text{V}$	—	—	1	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 2.5\text{mA}, V_{CE} = 10\text{V}$	4.5	6.0	7.5	Volts
Gate-Emitter Cutoff Current	I_{GES}	$V_{GE} = V_{GES}, V_{CE} = 0\text{V}$	—	—	0.5	μA
Input Capacitance	C_{ies}		—	—	5.0	nF
Output Capacitance	C_{oes}	$V_{GE} = 0\text{V}, V_{CE} = 10\text{V}$	—	—	3.8	nF
Reverse Transfer Capacitance	C_{res}		—	—	1.0	nF
Total Gate Charge	Q_G	$V_{CC} = 600\text{V}, I_C = 25\text{A}, V_{GE} = 15\text{V}$	—	125	—	nC
Forward Voltage Drop	V_{FM}	$I_F = 25\text{A}$	—	—	1.5	Volts
Thermal Resistance (Junction-to-Fin)	$R_{th(j-f)}$	Per IGBT	—	—	1.2	$^\circ\text{C/W}$
		Per Clamp Diode	—	—	1.7	$^\circ\text{C/W}$



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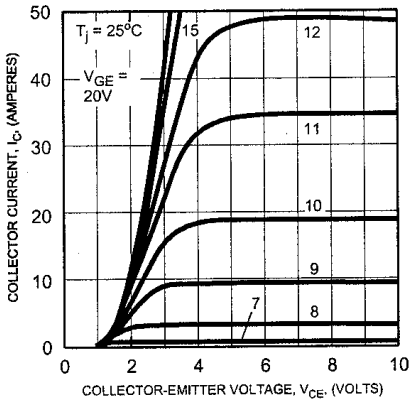
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units	
IGBT Inverter Sector							
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1	mA	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{CE} = 10V, I_C = 2.5mA$	4.5	6.0	7.5	Volts	
Gate-Emitter Cutoff Current	I_{GES}	$V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	0.5	μA	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 25A, T_j = 25^\circ\text{C}$	—	2.7	3.4	Volts	
		$V_{GE} = 15V, I_C = 25A, T_j = 150^\circ\text{C}$	—	2.45	—	Volts	
Input Capacitance	C_{ies}		—	—	5.0	nF	
Output Capacitance	C_{oes}	$V_{GE} = 0V, V_{CE} = 10V$	—	—	3.8	nF	
Reverse Transfer Capacitance	C_{res}		—	—	1.0	nF	
Total Gate Charge	Q_G	$V_{CC} = 600V, I_C = 25A, V_{GE} = 15V$	—	125	—	nC	
Resistive	Turn-on Time	$t_{d(on)}$	$V_{GE1} = V_{GE2} = 15V,$	—	—	100	nS
Load	Rise Time	t_r	$V_{CC} = 600V, I_C = 25A,$	—	—	200	nS
	Turn-off Time	$t_{d(off)}$	$R_g = 13\Omega,$	—	—	150	nS
Switching	Fall Time	t_f	Resistive Load	—	—	350	nS
Emitter-Collector Voltage	V_{EC}	$I_E = 25A, V_{GE} = 0V$	—	—	3.5	Volts	
Reverse Recovery Time	t_{rr}	$I_E = 25A, V_{GE} = 0V,$	—	—	250	nS	
Reverse Recovery Charge	Q_{rr}	$di_E/dt = -50A/\mu s$	—	0.22	—	μC	
Thermal Resistance (Junction-to-Fin)	$R_{th(j-f)}$	Per IGBT	—	—	1.2	$^\circ\text{C/W}$	
		Per FWDi	—	—	1.9	$^\circ\text{C/W}$	



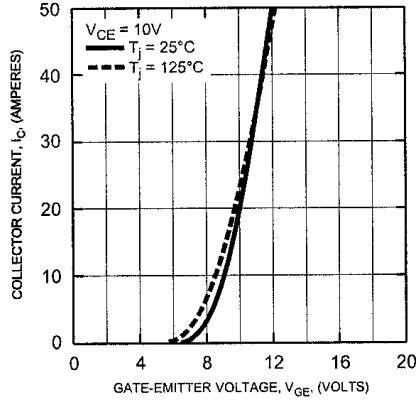
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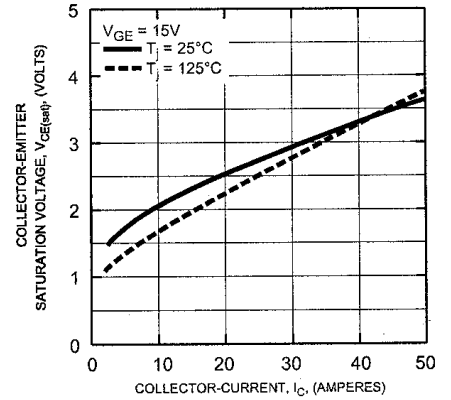
OUTPUT CHARACTERISTICS (TYPICAL)



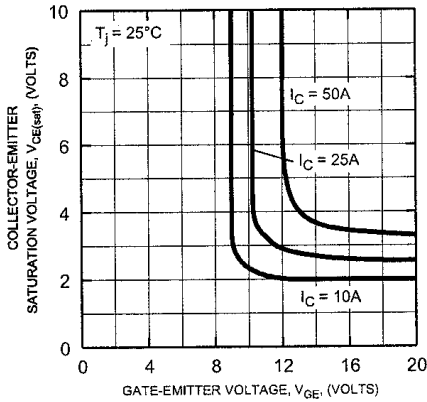
TRANSFER CHARACTERISTICS (TYPICAL)



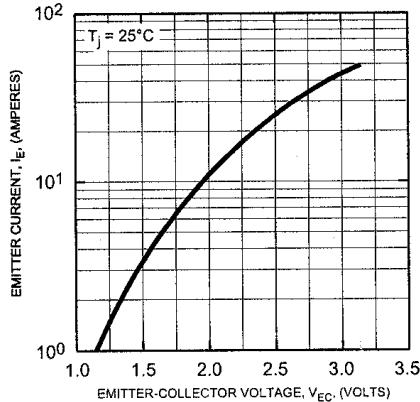
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



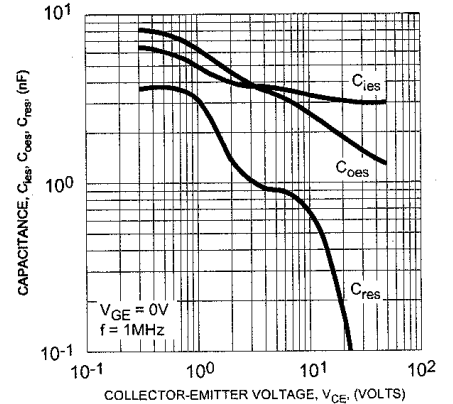
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



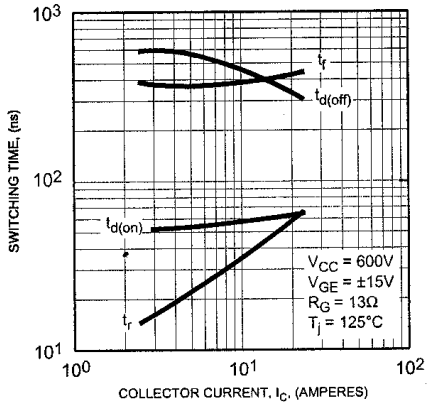
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



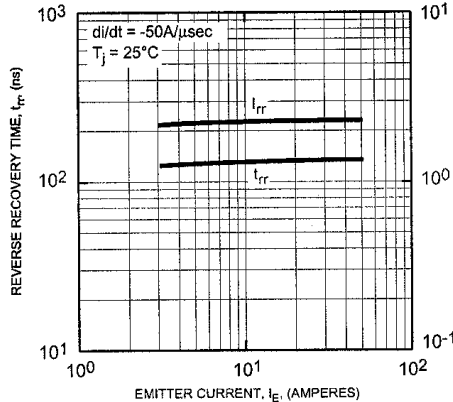
CAPACITANCE VS. V_{CE} (TYPICAL)



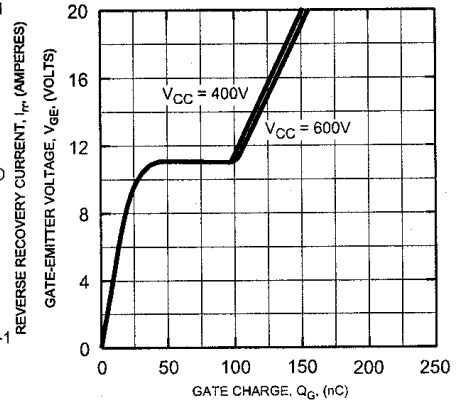
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}





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